

Smooth time-dependent receiver operating characteristic curve estimators

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The receiver operating characteristic curve is a popular graphical method often used to study the diagnostic capacity of continuous (bio)markers. When the considered outcome is a time-dependent variable, two main extensions have been proposed: the cumulative/dynamic receiver operating characteristic curve and the incident/dynamic receiver operating characteristic curve. In both cases, the main problem for developing appropriate estimators is the estimation of the joint distribution of the variables time-to-event and marker. As usual, different approximations lead to different estimators. In this article, the authors explore the use of a bivariate kernel density estimator which accounts for censored observations in the sample and produces smooth estimators of the time-dependent receiver operating characteristic curves. The performance of the resulting cumulative/dynamic and incident/dynamic receiver operating characteristic curves is studied by means of Monte Carlo simulations. Additionally, the influence of the choice of the required smoothing parameters is explored. Finally, two real-applications are considered. An R package is also provided as a complement to this article. © 2017, © The Author(s) 2017.

Censoring

discrimination

kernel density estimator

receiver operating characteristic curve

sensitivity

specificity

albumin

bilirubin

biological marker

biological marker

age

aged

Article

chronic obstructive lung disease

cohort analysis

controlled study

diagnostic test accuracy study

false positive result

forced expiratory volume

human

kernel density estimator

kernel method

major clinical study

Monte Carlo method

mortality

prediction

primary biliary cirrhosis

prothrombin time

receiver operating characteristic

sensitivity and specificity

area under the curve

biostatistics

computer simulation

Kaplan Meier method

procedures

software

time factor

Area Under Curve

Biomarkers

Biostatistics

Computer Simulation

Humans

Kaplan-Meier Estimate

Monte Carlo Method

ROC Curve

Software

Time Factors